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SCIENCE AND MORALITY.—IN THE YEAR 2000.

Science et Morale. Par M. Berthelot. Pp. xii + 515. (Paris : Calmann Lévy, 1897.)

THOSE who wish to gain some idea of the spirit animating scientific workers in France at the present day may study with advantage this new proof of the inexhaustible energy of the marvellously versatile perpetual Secretary of the Academy of Sciences. The book is for the most part a collection of essays on biographical, educational, historical and philosophical subjects, together with addresses, letters, and speeches on similar matters; although of unequal interest and importance, these will in many cases more than repay careful perusal and examination.

It is the work of a very remarkable man—one of the most remarkable of our time—who describes his own career most truly when he says :—

“Depuis cinquante ans, je recherche les connaissances des choses avec une curiosité et une sympathie infinies.”

Infinite curiosity and infinite sympathy—although both qualities that should characterise all scientific workers—are too seldom sufficiently developed in one individual, the latter especially being often strangely absent : the study of a man in whom such qualities are conjoined is therefore interesting in many ways, and becomes the more so as the conviction grows that he is a striking example of a type of mind altogether rare.

A student in his laboratory during the earlier years of his life, since 1870, when the desire to serve his country in the hour of her great need led him to enter the public service, he has taken part in the work of national defence, of public instruction and of general politics, attaining recently to the high rank of Minister of Foreign Affairs—besides continuing with unremitting ardour the researches which have made his name famous throughout the scientific world.

The first to show that the natural fats could be artificially prepared from acids and glycerol; the first to study the great group of vegetable oils, the turpentine, scientifically; the first to establish (in 1859) the existence of acetylene as a definite compound, and the discoverer of the method of producing it directly from carbon and hydrogen : of late years he has devoted his attention chiefly to thermochemical inquiries, and has rendered lasting service especially by the invention of the calorimetric bomb—one of the most ingenious instruments of scientific research ever devised.

Moreover, recognising that

“En toutes choses, c'est en remontant aux origines que l'on arrive à mieux comprendre l'état présent,”

he has devoted himself with surprising assiduity also to the study of ancient Arabic, Greek and other writers from whom information could be gleaned of the history of scientific discovery.

The ultimate predominance of science in all human affairs is the key-note sounded through out the volume this being carried in the final essay to a point beyond

which even writers of fiction have scarcely dared to travel.

“La science domine tout : elle rend seule des services définitifs. Nulle homme, nulle institution désormais n'aura une autorité durable, s'il ne se conforme à ses enseignements !”

These, the closing words of the preface, are words of indubitable truth; yet how few there are who will thoroughly appreciate their importance and significance—who will understand the *full* meaning of the word science : were it appreciated at all generally, how much more might be accomplished even with our present imperfect means ! The conviction that such is the case should at least lead us to do our utmost to make the doctrine intelligible and popular; and to this end attention may be drawn to M. Berthelot as a most powerful and engaging witness.

“La Science et la Morale,” the opening chapter in the book, is a vigorous and eloquent essay in which the thesis is maintained that morality has no other basis than that which science furnishes : that progress, past and present, of morality, both in the case of individuals and of society, has been and always will be correlative with the progress of science. Frankly hostile to all theories of the divine origin of moral laws, M. Berthelot, in fact, is the outspoken advocate of the view that man is himself the source of morality.

“L'homme trouve la morale en lui-même et il l'objective en l'attribuant à la divinité.”

And a determined enemy of the ecclesiastical spirit, although less militant and incisive perhaps, he insensibly reminds us in many ways of Huxley—both having the same object in view and the same hatred of false pretence and unscientific method.

The next essay of importance, entitled “La Science Educatrice,” written apparently in 1891, deals with the crisis in secondary education consequent on the revolution going on in France as elsewhere against an exclusively classical system, and in favour of the introduction of science as a necessary element. Although the arguments used are very largely those with which we are familiar, being presented with the literary grace peculiar to the skilful French writer, the article is one that may be read with pleasure as well as studied with profit. The history of secondary education in France is sketched in a most interesting manner, and the many faults of the present system are clearly recognised and pointed out, as well as the reasons for instituting changes.

M. Berthelot, of course, insists that scientific studies should be made correlative with other studies from the outset. He also dwells on the capital importance of science to the moral as well as the intellectual education of humanity.

“L'habitude de raisonner et de réfléchir sur les choses, le respect inébranlable de la vérité et l'obligation de s'incliner toujours devant les lois nécessaires du monde extérieur, communiquent à l'esprit une empreinte ineffaçable. Elles l'accoutument à respecter les lois de la société, aussi bien que celles de la nature, et à concevoir les droits et le respect d'autrui comme une forme même de son propre droit et de sa propre indépendance personnelle.”

It is noteworthy that M. Berthelot is in agreement with those of us who hold that our children—especially girls—are too frequently subject to severe over-pressure owing to the multiplicity of subjects they are forced to study at school.

“A surcharger l'esprit des enfants par l'acquisition réelle ou prétendue de tant de connaissances diverses, on risque de le fatiguer avant l'heure et d'en empêcher l'évolution normale. On ruine en même temps la santé à l'âge du développement physique ; risque plus marqué encore pour les jeunes filles que pour les jeunes garçons.”

And he also corroborates the view that great injury is often done by preparation for examinations. Thus, speaking of those who are preparing to compete for admission into higher schools, such as the École polytechnique, he writes :—

“Tandis que les candidats futurs s'y consacrent tout entiers, souvent avec un effort excessif qui épuise leur santé, ils abdiquent leur individualité et, absorbés par le mécanisme de la préparation, ils perdent, eux aussi, la curiosité et l'amour de la réflexion originale.”

Would that this doctrine could be brought home to, and made popular with, our Indian Civil Service Commissioners and other such examining bodies. Perhaps the country will some day realise what price it has paid for the destruction of nepotism, even if it do not question the efficacy of the method it has adopted ; and at least we may hope that in times to come, medical men will respect the injunction, “Physician, heal thyself,” after recognising the injury that is done by over-study to the mental powers of students qualifying to join the profession. But those will be days when true morality will have a place in education because true science has found a place in it.

“La haute culture et la loi militaire” is an interesting report of speeches delivered in the Senate in 1888–89, which were directed against the introduction of a law making three years' military service compulsory on all classes, and favouring the limitation of service to a much shorter period in the case of the student class, who are pictured as the backbone of the community. In the course of this debate M. Berthelot made the interesting statement that he is the grandson of a village farrier.

The biographical sketches in the volume include graceful notices of Pasteur, Claude Bernard, Paul Bert, and F. André.

In a charming account of the doings of a colony of ants which he had sought to dislodge, M. Berthelot displays himself as an ardent naturalist observer as well as psychologist ; but it is not the first time that he has appeared in such a character—indeed, he tells us that he has for years past made these remarkable insects the subject of careful study.

The historical essays printed in the latter part of the volume are good examples of his style and versatility : that on the discovery of alcohol and of distillation, as well as that on the origin of chemical industries, may be specially commended to chemists as being full of interest ; the essay on Papin is an eloquent attempt to do further justice to the memory of one for whom a capital share in the invention of the steam-engine may be claimed.

Very appropriately, as emphasising the point of view

taken throughout the work, M. Berthelot publishes, as the last chapter in the volume, a speech delivered in 1894, in which a fanciful sketch is given of the changes that it may be expected will have been brought about at the close of another century—in 2000—through the introduction of science into all our affairs :—

“Dans ce temps-là, il n'y aura plus dans le monde ni agriculture, ni pâtres, ni laboureurs : le problème de l'existence par la culture de sol aura été supprimé par la chimie ! Il n'y aura plus de mines de charbon de terres, ni d'industries souterraines, ni par conséquent de grèves de mineurs ! Le problème des combustibles aura été supprimé par le concours de la chimie et de la physique. Il n'y aura plus ni douanes, ni protectionnisme, ni guerres, ni frontières arrosées de sang humain ! La navigation aérienne, avec ses moteurs empruntés aux énergies chimiques, aura relégué ces institutions surannées dans le passé ! Nous serons alors bien prêts de réaliser les rêves du socialisme . . . pourvu que l'on réussisse à découvrir une chimie spirituelle, qui change la nature morale de l'homme aussi profondément que notre chimie transforme la nature matérielle !”

It is suggested that we shall have tapped the central fires of the earth, and thence derive our supplies of energy, and that we shall live on tabloids artificially prepared. As a modest picture of the chemist's potential activity, the sketch is perfect, and it is unfortunate that it is necessary to introduce so important a *pourvu que* in order to keep expectation within due bounds ! M. Berthelot is even a little inconsequent, and forgets, perhaps, that in an earlier address on the place of science in agriculture he paints a somewhat different picture and, perhaps, a nobler one :—

“Or nul idéal n'est supérieur à celui de l'agriculture. La vie des champs est le type normal de la vie humaine. Là seulement, l'homme se développe en toute plénitude. La vie des champs favorise à la fois la santé matérielle des corps et la santé morale de l'esprit. Le paysan robuste, laborieux et intelligent, a toujours fait la force des nations.”

If agriculturists are thrown out of employment by the disappearance of agriculture, what are they to do ? All cannot engage in the manufacture of compressed food in the synthetical laboratories which will supersede Nature ; and besides this to waste solar energy in the manner implied would be unscientific. Moreover, even the most ardent evolutionist will require more than one hundred years to reduce the stomach of the city alderman to such dimensions that a few wafers of nitrogenous and carbohydrate materials will suffice to produce in it the effect of a full meal, even if fed besides with speeches of inordinate length and dulness.

But closely as he enters into competition with Jules Verne, in the course of his “excellent fooling,” M. Berthelot does not venture to look across the water and comfort us with the assurance that in the year 2000 we shall have a Minister of Education whose interest in the subject will be in some measure comparable with that of his distinguished French predecessor of a century before, and that there will be a true university established in London in which all branches of science and morality will consort and prevail in place of examinations and narrow-mindedness. No doubt he desired to draw the line at the probable.

H. E. A.